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SCIENCE NEWS LETTER

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THE WEEKLY SUMMARY OF CURRENT SCIENCE•

APRIL 11, 1931

Two Precious Jewels In His Head

See Page 232

A SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

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The Weekly Summary of Current Science

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DO YOU KNOW THAT

Conceited men are unsafe automobile drivers, is the conclusion of an Illinois state criminologist.

Berlin is constructing a great radio center, with broadcasting studios, laboratories, and a radio museum.

When Alaric set the ransom of Rome, in the year 409, he demanded as one item 3,000 pounds of pepper.

Archives tracing the history of the Italian people in America are to be collected at the Casa Italiana of Columbia University.

Where weeds grow luxuriantly is the site to choose for your garden, for the soil is likely to be good, government scientists advise.

A sarcophagus, pierced with holes so that it could be used as a cistern, is a recent discovery at the Roman provincial town of Apamea, in Syria.

A noiseless airplane is planned by a British engineer.

The cake-urchin is a type of sea-urchin shaped like a scalloped teacake.

A scientific expedition, equipped with seven motor tractors, is about to cross Asia, following in part the route taken by Marco Polo.

The All-Union Academy of Science of Soviet Russia expects to spend more than $2,500,000 on scientific expeditions in 1931.

The American golden plover, which breeds in Arctic America, migrates the entire length of North and South America, wintering in Patagonia.

Recently developed chemical compounds which may be mixed with rubber in the melted state are said to prolong the life of light-colored rubber goods without staining.

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Science Service presents over the radio, an address

CHEMICAL MUSIC

By Prof. Donald H. Andrews of the Department of Chemistry, the Johns Hopkins University, who has translated the Raman spectra of chemical compounds into musical notation, with results sometimes harmonious, sometimes weird.

Friday, April 17, 3:45 P. M., Eastern Standard Time

Over Stations of

The Columbia Broadcasting System

PHYSICS—INVENTION

Invention Makes Electricity Directly From Sunlight

Discovery of German Scientist Increases Current Output From Light-Sensitive Cells More Than Fifty Times

THE PROBLEM of using the vast energy of the sun for human purposes is nearing a solution. Dr. Bruno Lange of the Kaiser Wilhelm Institut, Berlin, has recently perfected a device which converts sunlight into electric current more completely than ever before, at a price that may compete with present hydroelectric installations.

The exhaustion of our coal supply in a few hundred years is no longer to be feared if Dr. Lange's claims are justified. On the contrary we shall now have access to enormously more power than ever before. An expansion of human engineering activities to a new scale, similar to what happened after the invention of the steam engine, is foreshadowed by this latest development in photoelectricity.

Talking pictures, television and automatic control devices in every branch of technology will be the first to benefit by the new light-sensitive cell. Light-sensitive vacuum tubes containing potassium or caesium, which have played a fundamental part in recent engineering developments, will probably be replaced in most of their uses by the cheaper and simpler Lange device.

Silver selenide is the substance that best does the trick of converting light to electricity at present. A sheet of metal is covered with a thin layer of silver selenide which in turn is coated with a transparent layer of a second metal only a few molecules thick. Light passing through the transparent film sets up a current between the two layers of the metallic sandwich.

Fifty to a hundred and fifty times more current is obtained from this than from a similar sandwich of copper oxide between two layers of copper, which was the immediate forerunner of the silver selenide cell. The superiority of the copper oxide sandwich over all other converters then known was discovered three years ago. Experiment has verified the conjectures about the possible applications of such cells. A copper oxide cell three inches square has driven an electric motor by dull sunlight for some months now in the Siemens Laboratory in Berlin.

Rival patents have been taken out in the British patent office on the copper oxide invention both from America and from Germany. Dr. L. O. Grondahl and Dr. Paul H. Geiger of Pittsburgh are the American inventors. Dr. Lange invented the German form of the cell. The terms of his patent are sufficiently general to cover the use of silver selenide and other substances as well as copper oxide.

The Westinghouse Company are the owners of the American patent, while the German invention belongs to Siemens and Halske, another large electrical concern.

Use of Silver Selenide

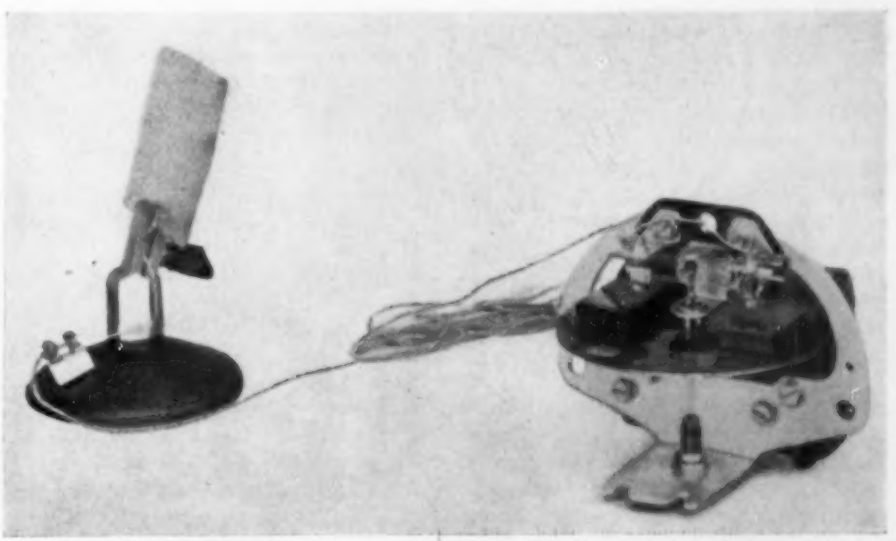
Silver selenide is a very late arrival on the field. The discovery of the principle on which the invention depends was made with the copper oxide sandwich about which, therefore, much more is known.

The Grondahl-Geiger invention has thus a longer history than Dr. Lange's. Dr. Grondahl had previously devised a cell almost identical with the photocell sandwich for use as a rectifier, that is, to convert alternating current into direct current. The rectifier has already been completely successful commercially.

A coil of copper wire pressed on top of the oxide by a plate of glass forms the upper electrode of the Grondahl photocell. Dr. Lange, however, deposits a thin layer of copper or other metal by cathodic sputtering on the cuprous or other sensitive substance. A wide mesh grid of metal is fixed to this. By this means Dr. Lange is able to obtain larger currents from the copper oxide sandwich using a given strength of light. The selenium compound, whose use has just been announced, still further increases the efficiency of the cell.

Dr. Lange's first contribution consisted in giving the cuprous oxide cell a more favorable, more applicable form than ever before, though a number of other investigators deserve credit for the scientific groundwork on which his advance is based.

The very first light-sensitive cell was of selenium made in 1885 by Warner Siemens, gifted co-founder of the company which is now developing Dr. Lange's invention. Sulphides of silver, lead and molybdenum have also been used for some time with very small efficiency. Dr. A. H. Pfund of the Johns Hopkins University, and Dr. W. W. Coblentz of the (*Turn to page* 235)



COPPER OXIDE LIGHT-SENSITIVE CELL AND MOTOR

This cell, left, has been running the small electric motor, right, in a laboratory in Berlin for some months. The new development uses silver selenide to greatly increase its efficiency and brings the commercial production of electrical power from sunlight within the realm of possibility.

MEDICINE

Serum Made Safe For Even Protein-Sensitive Patients

New Process Changes Chemical Nature of Serum Protein Making It Harmless But Leaving It Effective

A NEW chemical process that is expected to eliminate all danger from protective or curative serum administrations was reported by Prof. J. Bronfenbrenner of Washington University, St. Louis, at the meeting of the American Association of Immunologists in Cleveland.

The use of these sera has become increasingly popular for treating diseases and for giving protection from diseases. Toxin-antitoxin for diphtheria and antitetany injections are familiar examples. Occasionally, however, such serum injections are followed by grave complications and even death. This has made some physicians hesitate to use the sera.

Only one in 20,000 of those receiving serum for the first time develop alarming symptoms and only one in 50,000 die as a direct result of the treatment. Medical scientists are trying now to eliminate this last bit of hazard.

The reason for the hazard is that some persons have a specific sensitivity to foreign protein. Such are the victims of asthma and hay fever. The same protein does not always affect all sensitive individuals, some being sensitive to the protein of horse serum, and not sensitive to serum from other animals or to protein from other sources.

The human race may be divided into four categories with respect to their response to injections of these sera, Professor Bronfenbrenner pointed out. Some, about one-tenth, have no ill effects after the injections. A small group, about one in 20,000, respond to injection of horse serum by an immediate violent reaction leading to collapse and sometimes death.

The bulk of people when given serum injections have so-called serum sickness to a more or less severe degree, varying from soreness at the point of injection to generalized fever and indisposition. These are considered normal in their reactions, however. The fourth group is composed of persons who may have reacted normally originally, but who became sensitive to serum as a result of previous injection. These may develop serum sickness very quickly and some of them may suffer severe complications and even die.

The process developed by Professor Bronfenbrenner and colleagues, D. M. Hetler and I. O. Eagle of Washington University, changes the chemical nature of the serum protein, so that it loses the quality of causing a specific reaction to it, but at the same time the immunizing or curative properties of the serum are left almost as effective as they were in the original serum.

Studies with animals showed that the new preparations of sera were not toxic. Further improvement of the chemical procedures is being sought in order to leave the curative and immunizing properties of the sera unaffected in potency.

Danger lurks in typhoid vaccine if it is improperly prepared, stored too long or not accurately tested, Prof. Stuart Mudd of the University of Pennsylvania told the meeting. He discussed a small epidemic which occurred in an institution where inferior anti-typhoid vaccine was used.

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MEDICINE

Leukemia Disease of Blood Combated by Rabbit Serum

THE conquest of a fatal disease, lukemia, will soon be made as the result of experiments reported to the American Association of Pathologists and Bacteriologists by Dr. W. C. Hueper of the Cancer Research Laboratory of the University of Pennsylvania.

Certain kinds of cancer are closely related to leukemia, which is a riotous growth of the white blood cells and a lessening of the red cells of the blood. The successful research by Dr. Hueper and his associate, Miss Mary Russell, may therefore be an important step toward the relief of cancer itself.

The first step in the development of the new treatment for leukemia was the growing of leukocytes, or white blood cells, in tissue culture outside the human body. Dr. Hueper was successful in causing the diseased overambitious white blood cells from a leukemic patient to thrive on artificial food given them in a glass tube. Leukemic white cells were injected in a perfectly healthy rabbit, causing a fight to occur between the abnormal white blood cells injected and the protective chemical forces in the rabbit's blood that resist any unmannerly and unruly multiplication of the white cells. As a result there were built up in the rabbit's blood unusual amounts of a substance that discourages the increase of white blood cells. Serum from the rabbit's blood containing this inhibitor was used for the treatment of leukemia.

So far only one human case of the disease has been treated and this was a case of long standing. The improvement of this patient was remarkable, although a complete cure will probably not be possible.

Using their own blood, Dr. Hueper and Dr. Ellice McDonald, Director of the Laboratory, made tissue cultures and showed that the anti-leukemic serum stopped the growth of the white blood cells. This causes them to be confident that the serum when applied clinically will check the disease.

Following closely upon the successful treatment of pernicious anemia with liver extract, Dr. Hueper's anti-leukemic serum promises to make an equally important conquest of disordered white blood cell conditions. Anemia is an abnormal lessening of the red blood cells while leukemia is an abnormal increase of the white cells.

While leukemia is not a widely prevalent disease it may be found in nearly every hospital of any size. Some forms seem to be hereditary. It is nearly always fatal. Often leukemias of long standing turn into the form of cancer known as leukosarcoma, a malignancy of the glands of the body.

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CHEMISTRY

Synthetic Lubricating Oil Made Out of Paraffin Wax

Man-Made Lubricant, Said to be Superior to Crude-Oil Product, is Being Tested for Many Different Uses

JUST AS the chemist in past years has invented ways of making gasoline out of heavy oils, he now has made a synthetic lubricating oil out of paraffin wax.

This accomplishment which further allows the oil producer to fit his product to the market regardless of his crude oil supply was reported to the American Chemical Society by F. W. Sullivan, V. Voorhees, A. W. Neely and R. V. Shankland, chemists of the Standard Oil Company of Indiana. They flew to the Indianapolis meeting in an airplane oiled with synthetic lubricant of their own making.

The man-made lubricating oil is claimed to be superior to the oil that is simply separated out of the crude petroleum during the usual refining process. It costs more money to make at present, but it can be made in any desired viscosity, it has the desired pale straw color, it does not oxidize easily and it is more resistant to temperature changes than any known natural oil.

In developing the new lubricant the chemists first determined through theory and experiment just what kind of hydrocarbons would make the best lubricating oil. Lubricating oils now in general use are complex mixtures of natural hydrocarbons left after gasoline and kerosene are distilled away and the asphaltic and waxy materials are separated out.

They found that the oil they wanted had its molecules made up of approximately two hydrogen atoms for each carbon atom and in its chemical formula the carbon atoms were arranged in a long chain. Having thus designed their new oil, the next job was to build it in accordance with the chemical blueprint.

In looking around for raw materials out of which to make the new oil, grain alcohol was considered and discarded. Finally paraffin wax, a petroleum by-product itself, was selected. It must be put through an intricate process. First it is "cracked" in much the same way that heavy fractions of crude petroleum are treated to yield gasoline sufficient to keep America's automobiles moving. This produces compounds known as olefines which when combined together, by a process the chemist calls polymerization, yield the desired oils.

At present the new synthetic lubricant is being given special jobs such as the oiling of gear shifts, shock absorbers and airplane engines.

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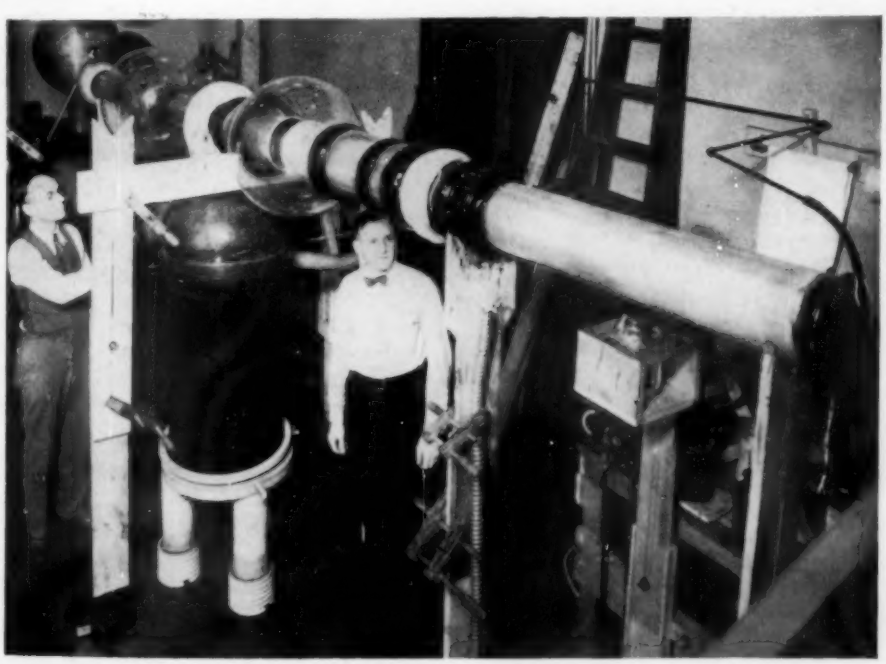

MOST POWERFUL X-RAY TUBE FOR MEDICAL USE

X-rays at 900,000 volts—by far the highest voltage ever attained in a tube built for continuous operation—are produced in the giant two-section X-ray tube to be installed in the New York Memorial Hospital. It is being built in the research laboratory of the General Electric Company, Schenectady, by Dr. W. D. Coolidge. In the photograph are two of Dr. Coolidge's assistants, L. E. Dempster, left, and H. E. Tanis, Jr., right.

PHYSICS

Music Quality Affected By Humidity in the Air

MUSIC, when heard at a distance, has an entirely different quality on a dry day from that on a humid day. Experiments by Dr. Vern O. Knudsen, acoustic expert of the University of California, show that sounds of high pitch can travel much farther in moist air than in dry air.

The frequencies of sound most affected by atmospheric moisture are those from 2,000 per second upward. These include the two topmost octaves of the piano. Sounds of middle and low pitch, such as the principal tones in the human voice range, are hardly affected at all. It has been known for some time that "super-sonic" notes of frequencies above audible sound were affected by the weather, but it was not supposed that ordinary sound was so markedly influenced.

This phenomenon is of concern principally in a very large auditorium. For example, a rear-seat auditor in the famous Hollywood Bowl might be listening to an orchestra 550 feet away. At this distance the high notes will be as much as ten times as loud in humid weather as in dry. Since the lower tones penetrate regardless of weather, there will be a great difference in the relative energies of tones of different pitch which strike the ear. Since practically all orchestral instruments give high harmonic sounds even in notes of nominally low pitch, the artistic quality will be quite different.

The determinations were made in two resonance rooms, the walls of which were treated to give maximum reverberation.

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PHYSICS-CHEMISTRY

Specific Heats and Atomic Weights

"A Classic of Science"

Dulong and Petit Discover an Odd Constant of Nature, Atoms of All Simple Bodies Have Same Heat Capacity

RESEARCHES ON SOME IMPORTANT POINTS OF THE THEORY OF HEAT. By MM. Petit and Dulong. (Presented to the Academy of Sciences on April 12, 1819.) Translated from the Annales de Chimie et Physique, x. 396. Published in Annals of Philosophy, Vol. XIV, Sept. 1819.

OUR FIRST care then was necessarily directed to what could render the measurements that we were to use as accurate as possible. Among the methods of determining the capacities of bodies, those in which the melting of ice or the mixture of bodies with water is employed, may doubtless, when properly conducted, lead to very exact results; but the greater number of the substances on which it is indispensable to operate can rarely be obtained in sufficient mass to enable us to apply either of these methods. It was necessary, therefore, to have recourse to a different method. The one which we have chosen appears to us to unite all the requisite conditions.

It is founded upon the laws of cooling. It is known that there exist between the velocity of cooling of different bodies placed in the same circumstances and the specific heats of the same bodies, relations, in consequence of which the ratio of the capacities may be deduced from that of the times of cooling. The first application of this principle was by Mayer, who satisfied himself that the capacities determined in this way differ little from those obtained for the same bodies by the method of mixture. Mr. Leslie, who has adopted the method of Mayer, has pointed out an additional precaution, of which the latter did not suspect the necessity; namely, to enclose the body on which we operate in an envelope, which must be always the same, in order to avoid the error which would result from any inequality in the radiating power of the surfaces. But the most important of all the causes of uncertainty, and to which neither Mayer nor Leslie paid any attention, is that which results from the unequal conductibility of the substances compared with each other. The influence of this cause is so much the less, the smaller the volume is of the bodies operated upon, and the slower the heat makes its escape from it. Our object then must be to fulfill these two conditions; but it is difficult to reconcile them, because when we diminish the mass of a body, we augment the velocity with which its heat is dissipated. However, by endeavoring to unite all the causes which contribute to retard the cooling of a given mass, we are enabled, as the experiments have shown, to place it in such circumstances that the difference in the conductibility of the substances operated on has no longer any sensible influence on the measure of the capacities.

Determining Specific Heat

The first method which presents itself for attaining that end is not to begin the observation till the temperature of the body is only a few degrees higher than that of the surrounding bodies. Accordingly all our experiments were made in an interval of temperature included between 10° and 5° centigrade of excess above the ambient medium. It is indispensable to measure the changes of temperature with the greatest possible care; for even a slight error in the estimation might occasion a great mistake in the result which it is the object to obtain. By operating, as we have said, at the same temperature for all the bodies, we avoid errors resulting from the graduation of the thermometer; and by observing this instrument through a glass, we can increase the size of its degrees so much as not to commit an error exceeding the 50th of a degree, which occasions a degree of uncertainty respecting the specific heat that may be overlooked. It is well known that all these precautions would be delusive if the temperature of the ambient medium were not rigorously the same in each case, and during the total duration of every experiment; but this condition was likewise fulfilled, for the body was always plunged into a vessel, the sides of which were blackened interiorly, and covered on all parts with a thick coating of melting ice.

To this first method of diminishing the rate of cooling, without any diminution of the requisite accuracy, we added another, the influence of which we could calculate from our knowledge of the laws of the communication of heat. It results from these laws that the velocity of cooling of a body may, *ceteris paribus*, be considerably diminished when its surface possesses but a very weak radiating power, and is plunged in an air very much dilated. To realize these circumstances, we resolved to operate upon solid bodies only in a state of very fine powder. In this state they were contained, and strongly pressed into a cylindrical vessel of silver very thin, very small, and the axis of which was occupied by the reservoir of the thermometer that served to point out the rate of cooling. This vessel was then placed in the centre of the vessel; and the air contained in it was dilated till its tension did not exceed two millimetres; and care was taken to reproduce the same vacuum in each experiment.

By the precautions just stated, we succeeded in making the cooling of very small bodies exceedingly slow, and consequently easy to observe with precision. To give an idea of the limit which we have obtained in this respect, it may be sufficient to say, that when we measured the capacities of the densest bodies, such as gold and platinum, the masses

The Vine and the Fig Tree

have been symbols of home from the earliest times. Read their history, as worked out by

De CANOLLE

who studied the origins of cultivated plants, next week in the

CLASSIC OF SCIENCE NO. 159

on which we operated did not exceed the weight of 30 grammes; and that in the cases in which the cooling was most rapid, its duration was not less than 15 minutes.

It would now be requisite to give the formula which served for the calculation of the observations; but the details into which we should be obliged to enter respecting the manner of making the different corrections depending on the method of proceeding would lead us into a discussion which we reserve for the publication of the definitive results of all the direct experiments which we have made on the subject. We shall add only a single remark, that having compared the specific heats thus obtained for the worst conductors with those given by the method of mixture, or by the calorimeter, the remarkable agreement has afforded the most convincing proof of the accuracy of the process which we have adopted.

We shall now present in a table the specific heat of several simple bodies, restricting ourselves to those results about which we entertain no doubt.

The Ratio

	Specific heats, that of water being 1.	Weight of the atoms, that of oxygen being 1.	Product of the weight of each atom by the corresponding capacity.
Bismuth	0.0288	13.300	0.3830
Lead	0.0293	12.950	0.3794
Gold	0.0298	12.430	0.3704
Platinum	0.0314	11.160	0.3740
Tin	0.0514	7.350	0.3779
Silver	0.0557	6.750	0.3759
Zinc	0.0927	4.030	0.3736
Tellurium ...	0.0912	4.030	0.3675
Copper	0.0949	3.957	0.3755
Nickel	0.1035	3.690	0.3819
Iron	0.1100	3.392	0.3731
Cobalt	0.1498	2.460	0.3685
Sulphur	0.1880	2.011	0.3780

To make the law intelligible, which we propose to make known, we have joined, in the preceding table, to the specific heats of the different bodies, the relative weights of their atoms. These weights are deduced, as is known, from the ratios observed between the weights of the elementary substances that unite together. The care taken for some years in the determination of the proportions of most chemical compounds can only leave slight uncertainties with respect to the data which we have employed; but as no precise method exists of discovering the real number of atoms of each kind which enter into a combination, it is obvious that there must always be something arbitrary in the choice of the specific weight of the elementary molecules; but the uncertainty can be only in the choice of two or three numbers which have the most simple relation to each other. The reasons which have directed us in our choice will be sufficiently explained by what follows. We shall satisfy ourselves at present with saying, that there is none of the numbers on which we have fixed which does not agree with the best established chemical analogies.

We may now, in consequence of the data contained in the preceding table, calculate easily the ratio which exists between the capacity of atoms of a different kind. We may remark, that in order to pass from the specific heats furnished by the observations to those of the particles themselves, it is sufficient to divide the former by the number of particles contained in the same weight of the substances which we compare; but it is clear that the number of particles for equal weights of matter are reciprocally proportional to the density of the atoms. We shall obtain, therefore, the result wanted by multiplying each of the capacities deduced from experiment by the weight of the corresponding atom. These different products are contained in the last column of the table.

Heat Capacity of Atoms

The simple inspection of these numbers exhibits an approximation too remarkable by its simplicity not to immediately recognize in it the existence of a physical law capable of being generalized and extended to all elementary substances. These products, which express the capacities of the different atoms, approach so near equality that the slight differences must be owing to slight errors either in the measurement of the capacities, or in the chemical analyses; especially, if we consider that in certain cases these errors derived from these two sources may be on the same side, and consequently be found multiplied in the result. The number and diversity of the substances on which we operated not permitting us to consider the relation thus pointed out, as simply accidental, we are authorized to deduce from them the following law:

The atoms of all simple bodies have exactly the same capacity for heat.

If we recollect what has been said above respecting the kind of uncertainty which exists in fixing the specific weight of the atoms, it will be easy to conceive that the law which we have just established will change if we adopt for the density of the particles, a supposition different from that which we have chosen; but in all cases the law will exhibit a simple ratio between the weights and the specific heats of the elementary atoms; and it is obvious that when we had to choose among hypotheses equally probable, we were naturally led to decide in favor of that which established the most simple relation between the elements which we compared.

But whatever opinion be adopted respecting this relation, it will enable us hereafter to control the results of chemical analysis; and in certain cases will give us the most exact method of arriving at the knowledge of the proportions of certain combinations; but if, in the subsequent part of our experiments, no fact occur to invalidate the probability of the opinion, which we entertain at present, we shall find in this method the advantage of fixing in a certain and uniform manner the specific weight of the atoms of all simple bodies that can be subjected to direct observations.

The law, which we have announced, appears to be independent of the form which bodies affect, provided always that we consider them in the same circumstances.

PIERRE LOUIS DULONG

French chemist and physicist who studied the theory of heat with Alexis Thérese Petit. He was associated with Berthollet, Berzelius and Arago.

ASTRONOMY

Most Rapidly Flashing Star Found By Dutch Astronomer

THE "electric sign of the sky," a star flashing out brightly every 100 minutes, has been discovered by H. van Gent, of the Leyden Observatory. The discovery was made while Mr. van Gent was performing research at the Union Observatory, in Johannesburg, South Africa. Many variable stars, which regularly change in brightness, are known and studied by astronomers, but this one, which is in the southern constellation of Puppis, part of Argo, the ship, changes more rapidly than any other known variable. Usually the period is a matter of days.

A difficulty arose in measuring the period of Mr. van Gent's star, because the exposure required to photograph it, on account of its faintness, is about half an hour, and during this time it makes a considerable change in brightness. However, when brightest it is of the 14th magnitude, and can be observed visually with the great telescope at the Union Observatory. From these observations with the eye aided with the telescope, the period has been determined. The change is about one magnitude, so when brightest it is about two and a half times as brilliant as at the minimum of the period of variation.

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PSYCHOLOGY

Criminality Results From Damage to Personality

THAT criminality is a disease resulting from damage to the personality was demonstrated by Dr. Ben Karpman of St. Elizabeth's Hospital to fellows of the American College of Physicians meeting in Washington.

Criminality is essentially a psychic disease, Dr. Karpman explained. It may be what psychiatrists call a neurosis. It is an expression of conflicting social and diverse drives.

Dr. Karpman believes that the criminal act appears as an attempt to neutralize the damage originally done to the personality. However, the act is only symptomatic and can find but partial satisfaction in the deed. This leads the individual to seek satisfaction constantly in further repetitions of the criminal acts, which in turn leads to criminality as an habitual reaction.

If the source of irritation to the personality is removed, it should be possible to restore the criminal, or the patient, to his original state of health and moral rectitude.

This has been done in a few cases, Dr. Karpman said. However, psychotherapy, or treatment of diseased personalities and minds, is like a major surgical operation and requires post-operative care. The careful surgeon when discharging his patient directs him on how to live so as to avoid a recurrence of his ailment and to remain healthy. The patient who has recovered from a mental or personality disease needs similar direction and after-care. If he is returned to the same environment in which he became ill, a relapse may be expected. The necessary after-care of these cases requires extensive and expensive social service work, Dr. Karpman stated.

Science News Letter, April 11, 1931

ARCHAEOLOGY

Scabbard of Roman Sword Dredged Up in German River

DREDGERMEN operating along the west bank of the Weser near Bremen were astonished a short time ago to see the huge bucket of their machine bring up from the silty bottom the scabbard of a Roman sword. Rescued with but little damage, it now reposes in the Bremen Municipal Museum.

The find is described in the German scientific journal *Forschungen und Fortschritte* by Prof. Alwin Lonke of the Museum. The scabbard is made of wood, which was enclosed in an outer sheath of leather, and that in turn overlaid with ornamental plates of metal wrought with artistic designs.

The scabbard was designed for the typical Roman short sword, for it is only about twenty inches long. Its width is a little over three inches. The iron blade of its sword had almost wholly disappeared, only a rusted fragment remaining.

What the Roman officer who bore his weapon in this scabbard was doing away up there on the northwest coast of Germany, very far from the nearest Roman city, is hard to guess. There may have been occasional Roman galleys on reconnaissance in the Weser, or possibly the sword may have been in the hands of a German warrior, either through the fortunes of war or through purchase, when it was lost on the swampy shore of the Weser nearly two thousand years ago.

Science News Letter, April 11, 1931

IN SCIEN

ZOOLOGY

The Precious Jewels In His Head Are Twain

See Front Cover

DID YOU ever stop to take a really good look at a toad's eyes?

Just as many a plain-faced person is redeemed from ugliness by having fine eyes, so also does the toad find salvation from his ungraceful form, his abysmal mouth, his warty skin. His eyes are of beryl and chrysoprase.

In his almost-too-often quoted line about the toad bearing a precious jewel in his head, Shakespeare was only repeating the current belief of his time, which was older than Aristotle. Though then it was believed that this jewel was concealed inside the toad's broad cranium, it seems quite possible that the idea first arose from someone's seeing a toad's eye shining in the dusk by reflected light. For like most hunters that stalk their prey by half-light, the toad has highly reflecting surfaces on his eyes.

Science News Letter, April 11, 1931

ENGINEERING

Stethoscope Used to Detect Flaws in Metal Welds

IF YOU see a serious young man industriously hammering a piece of pipe and listening to it through a regulation physician's stethoscope, don't be alarmed.

For the familiar double tube listening device used by your doctor in inspecting your chest and heart is now a testing instrument to detect flaws in welds of pipes and other metal objects. As welding has replaced riveting in joining pieces of metal together, engineers have felt the need of a simple test to assure them that the fusion of the metal has been accomplished without leaving dangerous weaknesses. Welds that are defective give out a different sound when they are sharply tapped.

The new test was invented by A. B. Kinzel of the Union Carbide and Carbon Research Laboratories of Long Island City, N. Y.

Science News Letter, April 11, 1931

NE FIELDS

SEISMOLOGY

Alaska Lighthouse May Slide Into Sea

A HIGH BLUFF of solid rock towering above the sea at Cape Hinchinbrook, Alaska, has been so affected by a series of small earthquakes in that region, that it is about to crumble and fall into the sea, the Department of Commerce Lighthouse Service has reported.

This would be especially serious to one of the lighthouse keepers in the service, because it happens that his lighthouse is built upon this bluff. Since 1910, when the lighthouse was built, he has felt safe; but lately he has gone into the tower to keep the light going, only in fear and trembling, and has completely abandoned some of the other buildings on the spot.

Cracks have appeared in the rock of the cliff as a result of the little quakes, and these cracks have filled with water which has frozen. Tons of rock have already fallen to the beach as a result, and it is only a question of time before the lighthouse tower itself will crash.

A new station set back from the edge of the cliff will be built this summer; in the meantime the keeper of the light will have to be careful.

Science News Letter, April 11, 1931

ENTOMOLOGY—PUBLIC HEALTH

Trap May Exterminate Africa's Dread Tsetse Fly

THE TSETSE fly, worst enemy of man and beast through wide stretches of Africa, seems to have met his match in a sharp-witted naturalist, R. H. T. P. Harris, who has devised a trap it can't keep out of, and once in can't get out of.

The tsetse fly, which is the insect carrier of sleeping sickness among human beings and also of a disease known as nagana, even more fatal to domestic animals, has been responsible for the depopulation of wide and fertile lands in Africa, and for the slowing down of further settlement in the veldt country. It has been recognized that these parts of Africa will be literally no man's land until the fly can be conquered.

Since the fly is known as a hunter by sight rather than by scent, the first efforts against it were made by setting up dummy game animals, smearing them with a contact poison which would kill the insects when they alighted on it. This method, however, has not proved economical.

Mr. Harris' much more effective method is based on his close observation of the habits of the tsetse. He had seen that the fly is a nervous sort of creature, darting into the deepest shade it can find, resting a while, and then as abruptly darting toward the brightest light it sees.

So he rigged inverted trough-shaped shelters of cloth stretched on wooden frames. This provided attractive darkness for the flies. On top, over a small opening, he placed wire flytraps. The bright shaft of light streaming through the openings lured the flies upward—into the traps where they could only buzz about in futile attempts to escape until they died of exhaustion.

The traps are reported as being amazingly efficient in field operation.

Science News Letter, April 11, 1931

PSYCHOLOGY

Personality Is Defined As Effect on Others

THE VAGUE term "personality," which has so many different meanings when used by different persons, is properly defined as that which makes one effective, or gives one influence over others, Dr. Mark A. May, of the Institute of Human Relations, Yale University, said in a report to the Psychological Corporation of New York.

"If an individual is a 'weak sister' in the sense that his presence or absence makes no difference in the behavior of others, then he has a weak personality," Dr. May said, "if on the other hand his presence or absence makes a big difference in the conduct, ideas and attitudes of others, then he has a strong personality."

Dr. May's definition differs from that of many modern psychologists, he explained, because the latter regard personality as the way in which the individual responds to outside influences rather than as the way in which others respond to him.

Science News Letter, April 11, 1931

ARCHAEOLOGY

Secret Tunnel for Siege Found at Gaza in Palestine

A SECRET tunnel, which enabled the inhabitants of ancient Gaza to emerge from their city when it was besieged by its enemies, has been discovered by the expedition of the British School of Egyptian Archaeology.

The expedition, directed by Sir Flinders Petrie, has identified Tell el Ajjul in southern Palestine as almost certainly being the site of Gaza which figures in Old Testament history.

The tunnel which has been found was dug in the rock for a length of 400 feet and led out of the city. That such a tunnel was built indicates that the city feared heavy sieges and was prepared for them by this secret exit. Out of the tunnel, fighting men could suddenly rush for a night attack on the enemy, or else in desperation the population could use this exit in an attempt to abandon their city secretly.

In this season's excavations at the site, special attention is being given to the remains older than 2000 B.C. in the hope of making new discoveries regarding early events in Palestine.

Science News Letter, April 11, 1931

ARCHAEOLOGY

Jewelry of Nebuchadnezzar's Courtiers Found at Kish

SOLID GOLD ornaments and other articles of jewelry worn by men and women at the court of King Nebuchadnezzar, in the sixth century B. C., have been discovered at Kish by the Field Museum-Oxford University Joint Expedition to Mesopotamia.

Various levels of the ruins of Kish are being explored and are yielding objects from different periods of ancient history, the report states. More than 300 laborers are working under the direction of the staff archaeologists.

Work of opening and exploring Sumerian royal tombs more than 5,500 years old has begun. Remains of several chariots, oxen and harnesses have been found near the tombs.

A palace of the Sassanian period, 226 to 637 A. D. has been uncovered, and various rooms explored. Objects found in the palace ruins include carved stone heads of women, figures of flying angels, friezes of giants and animals, and plaques of lotus and pomegranate.

Science News Letter, April 11, 1931

SEISMOLOGY

Heavy 1931 Seismic Record Brings 31 Quakes in 3 Months

Disaster at Scene of Proposed Canal Starts Controversy; Scientists Make New Instruments to Record Shocks

THIRTY-FIVE earthquakes in three months, five of them major disasters to life and property in widely scattered parts of the world, is the appalling seismic record of 1931 to the end of March. Eleven quakes recorded in January, eleven in February and thirteen in March, culminating in the catastrophe that on the thirty-first overtook the city of Managua in Nicaragua, tell the story of an abnormally trembling earth.

These thirty-five earthquakes count only the ones important enough to figure in the day's news or to trace their autographs on the ever-vigilant instruments in seismological observatories. The lesser quakes that happen every day, the mere local shocks, were not counted. The data have been gathered for the use of scientists of the U. S. Coast and Geodetic Survey by Science Service, from the stations of the Jesuit Seismological Association, from official observatories of the United States and Canadian governments, and from numerous universities.

Canal Plans Affected

Whether the recent earthquakes in Nicaragua will have the effect of wrecking the second American interoceanic canal before it is built, is a question that is bound to smolder hotly until Congress is again in session, when it will probably break out with renewed vehemence.

Such an earthquake could do immense damage to canal locks, powerhouses and other mechanical appurtenances; or, if the canal were an ocean-level one, it might slide the side of a mountain into the narrow cut.

On the other hand, a good, solid earthquake shock usually takes the mischief out of a given region, so that no more heavy shocks need be expected for a good many years to come.

Earthquakes result from the building up of a state of tension in deep rock strata; after the slip has occurred the tension is relieved and only minor shocks follow. For this reason, the region around the northwestern end of Lake Nicaragua is safer from earthquakes today than it has been at any time during a long period of years.

Earthquake Preparedness Planned

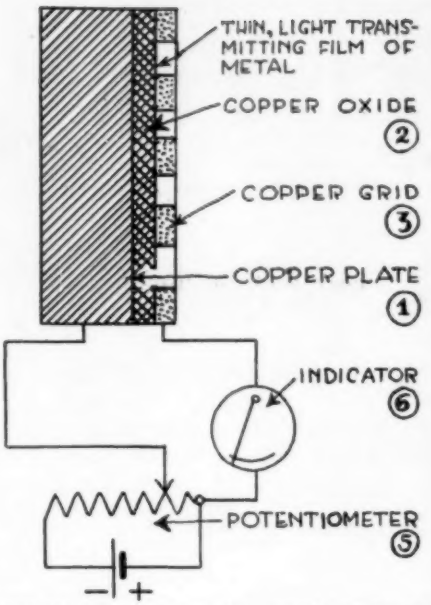
How seismologists are cooperating with engineers, architects and city planners in a program of preparedness against possible earthquakes in the United States was disclosed in a lecture recently before the Franklin Institute, given by Capt. N. H. Heck, chief of the division of terrestrial magnetism and seismology of the U. S. Coast and Geodetic Survey.

Capt. Heck stated, in part:

"Engineers are beginning to agree that major structures should be designed with regard to earthquake stress if the history of the region indicates that they are likely to be subjected to such stress. They are recognizing the lack of information and are demanding that more accurate information be obtained.

"In view of these statements, it is of particular interest that Congress in making provision for the work of the next fiscal year, has made provision for the start of this work and it should be in effective operation by the end of 1931.

"The purpose is to install instruments capable of recording accurately strong earthquake motions in places where history indicates that there is probability of earthquake activity of some intensity . . . . . Instruments of a satisfactory character are not in existence today except for several types that have been developed in Japan which are adapted to frequent strong activity. In this country the Bureau of Standards, the Coast and Geodetic Survey, the Massachusetts Institute of Technology and the Earthquake Research Laboratory at Pasadena are all at work on the development of such instruments, and it is expected that satisfactory instruments, even if not of the ultimate type, will be available before the end of the present year."



CHANGES LIGHT TO ELECTRICITY

A diagram drawn from the British patent already issued Dr. Lange which shows the construction of his copper oxide cell. The dimensions have been exaggerated for actually the layer of copper oxide is not thicker than two-thousandths of an inch, while the grid is a grating having a mesh about one to one-fifth of a millimeter wide. The copper plate and the grid form the terminals of the cell, and between them a potential of from one-tenth to two-tenths of a volt may be set up.

MEDICINE

Two Germs May Cause Blindness of Trachoma

POSSIBILITY that the later and more disastrous effects of the eye disease trachoma may be the result of two germs working together was demonstrated by Dr. Peter Olitsky of the Rockefeller Institute for Medical Research at the meeting of the American Association of Pathologists and Bacteriologists in Cleveland.

Before his death Dr. Hideyo Noguchi of the Rockefeller Institute had isolated a germ from human cases of trachoma which he believed caused the disease. This germ could produce a disease resembling the early stages of trachoma in monkeys and apes. Continuing Noguchi's work, Dr. Olitsky with his colleagues, R. E. Knutti and J. R. Tyler, have produced a disease closely resembling the later stages of trachoma, in which blindness occurs, by the action of the granulosis microbe discovered by Noguchi in conjunction with other bacteria found in eyelids.

PHYSICS—INVENTION

New Photoelectric Sunmotor Discussed By Its Inventor

By Dr. Bruno Lange
Kaiser Wilhelm Institut, Berlin
(In an interview with a Science Service correspondent)

PATENTS on the newer photocells, with a fifty times augmented effect, have been applied for by myself and Siemens and Halske. As long as the patents have not been published, I cannot, for obvious reasons, tell what metal combinations I use in these new cells. The electrodes also differ in their arrangements from those already used by Grondahl and Schottky.

Application of these cells to the production of energy out of the sun's radiation seems to be possible, but of course this is a task which can be accomplished only step by step.

Aggregates of a larger number of cells connected with each other seems to be the direction of the next development. There are still many difficulties of manufacture and of circuiting to be overcome. Even if these problems are successfully solved, the direct production of sun-generated power will be able to go into competition with the methods of fuel-burning or waterpower only in tropical and sub-tropical climates, where a steady strong radiation exists.

The sensitivity of my cells is nearly the same as that of the human eye, the curves showing a value of only 10 per cent. less than that of the eye. The cells are peculiarly sensitive to color-differences and have a sufficiently large output of energy to be used for many purposes without amplification. We already have built up microscopes for metallurgical purposes, allowing an objective control, the ocular of the microscope being replaced by these cells.

The cells will probably be on sale within a month.

There are a large number of technical purposes and applications for them. We have succeeded already in transmitting phonograph records, working with infrared rays instead of with the usual disks. All sorts of signalling methods through dense fog are possible by these methods. Even infrared telephony over long range seems to be possible. This seems to be a very promising way for signalling to ships in fog. The determination of the sun's position by flying machines going through clouds is another possibility.

One of Germany's biggest liners is going to be fitted with a new smoke and fire control on this principle, the air from various parts of the ship being pumped through a system of tubes and passing in front of such cells. When smoke passes before the cell, it sets off an alarm.

Another technical application should be of importance in steel-mills. Sheets of red-hot iron passing through the rollers radiate enough light to work these cells. The changing of direction of the rollers can therefore be worked automatically by them.

A large number of scientific applications are foreseen. We have already built microphotometers with their help. Another useful device will be an automatic recorder for determining the correct time of photographic exposures.

Science News Letter, April 11, 1931

DR. BRUNO LANGE

Of the Kaiser Wilhelm Institute, Berlin, who has discovered how to use silver selenide to increase the efficiency of the light-sensitive copper oxide cell more than fifty times.

Electricity From Sunlight

From page 227

U. S. Bureau of Standards are among those who have made the most important contributions to the problem in America. Dr. Duhme and Prof. F. Schottky in Germany recently came very near to anticipating Dr. Lange in his success. The greater simplicity and effectiveness of Dr. Lange's invention appears to be due to his clearer understanding of the underlying phenomena.

Large scale power is what distinguishes present-day civilization from the past. The heat and light of prehistoric sunlight stored in coal or more recently in the water of lakes are the motive power of our large industries.

The new photocell developments promise an entirely new method of power production. The energy of the sun's rays streaming down ceaselessly day after day on the surface of the earth means an enormous waste of power. Dr. Lange has given a method which may prove successful in putting the sun to work for man throughout the future history of the world.

It is just possible the world is standing at a turning point in the evolution of civilization similar to that which followed the invention by James Watt of the steam engine. For coal is not only limited in amount. It is also an extremely inefficient vehicle for the sun's energy.

The power which can actually be used, for instance, in an incandescent lamp, is a small fraction of one per cent. of the total sunlight stored in part in the coal, whose burning at the generating station produces the electric current. Lange's invention promises to put a lot of the other 99 per cent. to use.

Serious problems will of course be raised by the fact that the supply of the sun-power will not be continuous. Whether these will be solved by some form of storage arrangement or by operating the photogenerators in conjunction with some other kind of generator cannot be said at present. The energy storage problem is closely linked with that of power sources.

Some $25,000 per kilowatt is the estimate that Dr. Lange has made of the cost of installing the copper sandwich on a large scale as a means of trapping the power of sunlight. This at first seems impossibly large as a hydro-electric station can now be erected at a capital cost of $100 to $300 per kilowatt of capacity. A steam turbine plant using

coal is, of course, still cheaper to install but the running costs in labor, fuel and maintenance of equipment are much greater.

The hundredfold increase in efficiency by using silver selenide in place of copper oxide, however, appears to bring the cost within the economic range for competition in the power industry. Apart from this it is likely that further improvements in the form of the cell will be made. The idea is still in its infancy.

A square yard of copper oxide sandwich can produce several watts of energy in full sunlight, says Dr. Lange. Using this as a basis for calculation it is easy to see that a large power station of 300,000 kilowatts would require an area of about one square mile of the silver selenide cells.

The device does not lose its efficiency with time, and can be used with very intense illumination. Presumably the solar generators would be erected where there is practically no rainfall. The active surface could be protected from weather influences tending to destroy it by covering it with suitable transparent, resistant coatings.

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CHEMISTRY-NUTRITION

American Diet Lacks Vitamins Despite Nutrition Publicity

MANY TYPICAL American diets are lacking in proper vitamins despite the fact that vitamins have been stressed in extensive advertising the past few years. Prof. Walter H. Eddy of Columbia University, New York, a leading authority on nutrition, warned in his paper presented to the American Chemical Society at their meeting in Indianapolis last week.

The antineuritic vitamin B is the food factor most likely to be neglected in the foods we eat today, Dr. Eddy said. Vitamin B occurs in the wheat embryo and lack of it causes the disease beriberi. An insufficiency of this vitamin has been found by other investigators to cause gastrointestinal disturbances.

"We must not be lulled by a sense of security with regard to this and other vitamins," Dr. Eddy said in explaining that investigations of typical American diets showed that they could be improved greatly by doubling the amount of vitamin B in them. Rats fed on a menu similar to that eaten by British working men grew twice as fast when a little wheat germ material was added.

Dr. Atherton Seidell of the National Institute of Health, told of the isolation of the antineuritic vitamin to such a degree of purity that it is more potent than any other preparation yet obtained. Even this research has not yet revealed the true chemical nature of this vitamin.

Vitamin D, the antirachitic factor found in cod liver oil and generated by sunshine or ultraviolet light acting on fats, is the only vitamin which is sure to be present in sufficient quantity in our daily food, in Dr. Eddy's opinion. Through the extensive development of irradiation of foods by ultraviolet light, it is being placed in many food products and one large baking company is about to introduce it into all of its bread.

Vitamin C, the lack of which causes scurvy, is most important in the formation of good teeth, Dr. Eddy explained. This vitamin is found in citrus fruit juices.

The ability of the human body to make another of the vitamins, known as A, out of the yellow coloring matter of plants, known as carotin, was called to the attention of the chemists by Dr. Eddy. He announced that he had just tested a British preparation of pure crystalline carotin and that this material substitutes for vitamin A in the diet. This rôle of carotin in connection with vitamin A was discovered by Dr. T. Moore of Cambridge, Drs. I. M. Heilbron and R. A. Morton of Liverpool, and Dr. Euler, a German chemist. Scientists have known that yellow plants, such as yellow corn, are better sources for vitamin A but it had not been demonstrated before that the body could manufacture vitamin A out of the yellow carotin, so named because it is the coloring matter in carrots.

Colds and other infections can be guarded against by sufficient vitamin A, Dr. Eddy explained, in telling of research by other investigators who found that insufficient amounts of this vitamin in the diet promoted throat infections, stomach troubles, lung and kidney disorders and even some kinds of deafness.

Whether vitamin G is really the food factor that cures and prevents pellagra, the poverty disease of human beings, was questioned in a paper by Drs. Samuel S. Gurin and Walter H. Eddy of Columbia University, New York City.

In experiments on rats they found that two kinds of diseases of the skin were present in their experimental animals. And in the rats that got adequate amounts of beef extract and yeast rich in vitamin G, a trouble similar to human pellagra appeared in spite of their good growth. The chemists suggested that there are really two diseases, one prevented by vitamin G and another that is not.

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ASTRONOMY

Star Observed For First Time As Disc, Not Point of Light

Japanese Astronomer Observing Occultation Noticed That Distant Antares Took Four Seconds To Pass Edge of Moon

AN OBSERVATION of the star Antares as a round disc, not as the point of light that a star usually presents, even through the largest telescope, is reported by Prof. K. Nakamura, of the Kwasan Observatory at Kyoto, Japan. Though Professor Nakamura did not actually see the star in the sky as a disc like one of the planets, his observation is probably the first to show that the star is not a point, except for the indirect measures of its diameter with the interferometer.

Professor Nakamura was watching for Antares as it emerged from an occultation, or "eclipse," by the moon on January 15. As the moon passed on after hiding the star from view, he saw first the faint greenish companion that accompanies the star. Then, four seconds later, Antares itself, which is red in color, reappeared. As the moon has no atmosphere through which a star's grazing light must penetrate, the end of an occultation is usually very sudden, with the star flashing out more rapidly than any electric light when the switch is closed.

On this occasion, however, reported Professor Nakamura, it took the star at least a tenth of a second to come to full brilliancy. This is attributed to the fact that Antares has a very large diameter, though much too small to show directly as a disc in a telescope. Measures of the light and dark bands that appear in its light after being divided and reunited in the interferometer have afforded Prof. F. G. Pease, of the Mt. Wilson Observatory, the data from which to compute the diameter of Antares at four hundredths of a second. Though this is only one forty-five thousandth of the apparent diameter of the moon in the sky, it is the largest known diameter, large enough, if it were hollow, to contain the sun, together with the four inner planets Mercury, Venus, Earth and Mars, revolving in their usual orbits.

Therefore, as Professor Nakamura observed Antares emerge from occultation, he first saw one edge of the star beyond the moon, then, about a tenth of a second later, as the moon moved on about four hundredths of a second, the opposite edge was seen and the light came from the whole star. Only with a very large star could this effect be observed, for with one of average size the uncovering would be so rapid as to be practically instantaneous.

A similar effect can sometimes be observed by the naked eye with the brighter planets, like Venus, or Jupiter, now shining brightly in the western evening sky. If the planet is seen through the limbs of distant trees, a slight movement of either the eye or the trees may cause the planet to vanish, as a limb comes between. But the disappearance is noticeably gradual, quite different from the sudden extinction of the light of a bright star. The reason for this is just the same as for the gradual reappearance of Antares after occultation; to the naked eye the stars are point sources of light, but the planet has a small but appreciable disc.

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DO ANIMALS LAUGH?

Cats are preternaturally solemn, but their zoological cousins the canidae sometimes have facial expressions that make one wonder. This young fox, obtained for the trailside museum in Bear Mountain State Park, N. Y., by the American Museum of Natural History, was photographed in the middle of a "laugh" by W. H. Carr.

MEDICINE

Rheumatism Vaccine Promised By Minnesota Experiments

A VACCINE for rheumatism that holds promise of bringing to the medical profession a successful treatment for that common disease is now in an experimental stage of development, Prof. Benjamin J. Clawson of the University of Minnesota Medical School has disclosed in a report to the American Association of Pathologists and Bacteriologists.

Not for at least a year will it be possible for this new vaccine to be used by physicians generally. At present Professor Clawson is presenting his tentative results to his scientific colleagues, and his paper was entitled: "Experiments Relative to a Possible Basis for Vaccine Therapy in Rheumatic Fever."

Rheumatic fever, arthritis, or rheumatism as the disorder is variously known, in a very common disease. It is widespread through the world. Professor Clawson in making his vaccine takes the causative organism, *Streptococcus viridans*, which he has repeatedly isolated from the blood of patients having acute and chronic arthritis. This germ is heat-killed to make a vaccine in a conventional manner. This vaccine is not injected under the skin as is a common practice, since this method would tend to make the patient more hypersensitve. Instead it is injected directly into the blood stream.

In testing his vaccine upon actual patients, Professor Clawson is treating approximately a hundred sufferers from the disease. The vaccine will not be given general use until these tests prove its success.

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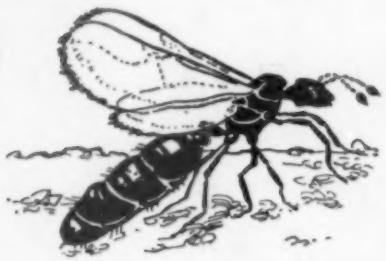
ENTOMOLOGY

Nature Ramblings

By FRANK THONE



Human Ant Eaters

THE eating of locusts or grasshoppers is a practice so ancient and well-known in some parts of the world as to excite no particular comment. The example of John the Baptist has given it the sanction of Biblical precedent even in the minds of those of us who are personally too squeamish to "eat bugs."

The use of ants as food, however, is neither so widely practised nor so well known. But there are at least a few places in the world where people find this industrious insect to be quite as tasty a morsel as her thriftless neighbor of the fable. In the interior of Brazil the natives make use of the females, or queens, of the leaf-cutting ant, a large and very destructive species that ranges throughout Latin America. It builds great ant-heaps, sometimes as much as twenty feet in diameter, and into these insect cities it carries huge quantities of leaves, which it strips from all imaginable kinds of plants. The leaves are not eaten by the ants, but used as a fertilizer for a kind of miniature mushroom which it cultivates.

The only members of the tribe that are eaten are the young queens, when they leave the parent colony on their mating flight. They are very large ants, reaching a length of as much as two inches, so that they are by no means contemptible mouthfuls. The natives gather them up when they come to earth, pinch off their heads, and fry the bodies in butter until they pop open like popcorn, and are quite crisp. Brazilian children, however, are like children everywhere, and do not always wait for the superfluous ceremony of cooking.

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ENGINEERING

Auto Knock Photographed In Cylinder Head

ENGINEERS have learned more about what happens in the cylinder head of an automobile engine while it is running by taking pictures of the actual explosions of each charge of gasoline, it is revealed in a report made to the American Chemical Society in Indianapolis last week by Lloyd Withrow and T. A. Boyd, of the General Motors Research Laboratory, Detroit. (See SCIENCE NEWS-LETTER, April 4, 1931, p. 212.)

These engineers used a fast camera with a constantly moving film to take the pictures through a narrow quartz window that extended all the way across the combustion chamber.

The photographs show that a knocking explosion differs from a non-knocking one only in the way the last portion of the charge burns. In a non-knocking explosion the flame continues to move at a comparatively constant rate to the end of the combustion space, while in a knocking explosion the latter portion of the charge inflames at a much higher rate than normal.

The rate of inflammation of the last part of the charge is so high that the explosion is thought to be spontaneous, caused by high temperature. But the engineers emphasized that this spontaneous form of ignition is not pre-ignition, which in years gone by was thought to be the cause of knock.

One effect of anti-knock compounds in gasoline, it was explained, is to prevent the extremely rapid inflammation of the latter portion of the charge and the accompanying pressure rise, which is the knock.

Science News Letter, April 11, 1931

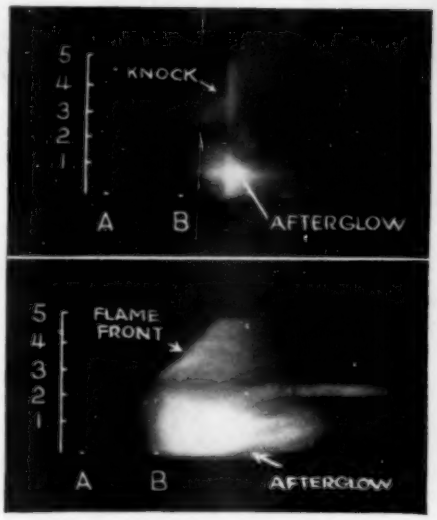
PHYSICS

Oldest American Newspaper Still Well Preserved

THOUGH yellow with age, specimens of America's first newspaper, "The Boston News Letter," have retained their strength and pliability during the more than two centuries since they were printed in 1704, tests made at the U. S. Bureau of Standards reveal.

Hemp and jute fibers were the chief or sole materials used in the manufacture of these time-defying old papers, it was discovered on analysis.

Science News Letter, April 11, 1931



CYLINDER HEAD EXPLOSIONS

The top photograph shows an explosion of a charge of gasoline in the cylinder head of an engine knocking violently. The bottom picture is of an engine, which is not knocking, burning benzene. The figures along the vertical line represent the distance in inches of the advancing explosion from the spark plug, A indicates the time of ignition and B denotes a point on the flame front 20 degrees after ignition.

Evidence of prehistoric men's efforts at mining have been found in Africa.

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VOLCANOLOGY

Mauna Loa, Hawaiian Volcano, Will Erupt Within Three Years

MAUNA LOA, one of the two most famous active volcanoes in Hawaii, is expected to erupt some time during the next three years, and probably within the next 18 months, according to word received by Director Horace M. Albright of the U. S. National Park Service from Dr. T. A. Jaggar, volcanologist of the U. S. Geological Survey.

According to Dr. Jaggar, who is in charge of the Hawaiian Volcano Observatory in the park, Mauna Loa is the very heart of volcanology for the whole world, and is like nothing else in its certainties of glorious "fireworks."

With an altitude of 13,675 feet above sea level, it is the second highest mountain in the Hawaiian Islands and one of the world's greatest volcanoes. It is steadily increasing its size as volcanic outbursts every five or ten years add huge masses of new lava to its bulk. The last great flow from this volcano occurred in 1926, after a dormancy of seven years, and lasted for nearly two weeks. A great flood of lava about 1,500 feet wide and thirty feet deep, it crept like a colossal motor tractor down the mountain's flank to the sea.

Spectacular and violent as are Mauna Loa's outbreaks, they are not dangerous, for there is always plenty of time and opportunity for onlookers to get to places of safety.

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ARCHAEOLOGY

Cotton Was Raised in Year One By Indians of Arizona

FROM a double handful of carbonized seeds found in a small bowl, capped by another vessel, resting on the shattered floor of an ancient dwelling, archaeologists of the Van Bergen-Los Angeles Museum field party have deduced the fact that cotton was cultivated in the Gila Valley, Arizona, as early as two thousand years ago.

The charred seeds, perfect in form, were easily identified by Dr. Thomas Kearney of the U. S. Department of Agriculture. He stated, "There seems to be no doubt that they are cotton seeds. The discovery of the expedition that cotton culture in the Gila Valley is of so great antiquity is most interesting."

According to Dr. Kearney, the cottons grown by the Pima and Hopi Indians from time immemorial are practically the same, the difference between them being mostly varietal. Furthermore, the cottons raised by these two tribes seem to be different from any of the commercial cottons of the world.

The Pima today are living on the same ground once occupied by the Hohokam, the people whose ancient village sites the Van Bergen expedition has been exploring. Consequently there is a possibility that cotton plants of the variety now used by the Pima Indians are of the same species as those grown by the ancients in the Gila twenty centuries ago.

The theory that the Hohokam probably used cotton in the manufacture of textiles was advanced by Arthur Woodward, curator of history in the Los Angeles Museum, when two or three of the mica schist paint palettes found in cremation pit burials were observed to have the imprint of very finely woven cloth in the burned paint on their surfaces. At that time, however, no definite evidence had been found supporting this theory.

Carbonized corn and cactus seeds found in the debris on the site also give an indication of something of the type of vegetal foodstuffs used by the Hohokam. Ceremonial deposits of burned deer antlers and the bone cores of mountain sheep horns as well as small mammal bones scattered through the trash heaps indicate that these primitive desert dwellers were good hunters as well as husbandmen.

Science News Letter, April 11, 1931

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• First Glances at New Books

Archaeology

ANCIENT CIVILIZATION OF THE ANDES—Philip Ainsworth Means—*Scribner,* 586 p., $7.50. An up-to-date general account of the ancient Peruvians was needed, and here it is. The thick volume is crammed with facts in well-ordered arrangement and there are 223 good illustrations. Mr. Means sets the scene of his story in an opening section on geography. Then he reconstructs the culture history of the people of the land down through the remarkable Incan dynasty, introducing archaeological and literary evidence on which the version is based. Then come additional chapters on life in the Incan era and the intellectual attainments of the ancient Andeans, and a 70-page account of one of the greatest Peruvian arts, weaving. A renascence of former Peruvian genius—if favorable circumstances should arise—is regarded by the author as possible, even likely some day.

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Botany

A TEXTBOOK OF BOTANY—J. M. Coulter, C. R. Barnes and H. C. Cowles—*American Book Company,* 3 vols., $1.80 per vol. The "Chicago text" occupies in America the position that the Strasburger text holds in Germany; it is a classic among American botanical textbooks. Five student generations have whetted their phytological teeth on this book, and it is still good. Now comes a thorough-going revision. The late Prof. J. M. Coulter was able to revise his own volume before he died; the second volume, on physiology, is *"neu bearbeitet"* by Prof. C. A. Shull; the third, on ecology, is still in preparation, being worked over by its author and Prof. G. D. Fuller. It will be a great thing to have a completely rejuvenated Chicago text available.

Science News Letter, April 11, 1931

Physics

UNITS USED TO EXPRESS THE WAVE LENGTHS OF ELECTROMAGNETIC WAVES—Henry D. Hubbard—*Government Printing Office,* 4 p., 5c. Now that the electromagnetic spectrum from slowly alternating electrical impulses to the shortest of X-rays has been proved to be one continuous spread of radiation, it is necessary to express wave lengths and frequencies in the same sort of language for the various sort of phenomena. This little Bureau of Standards pamphlet will help those working in one area of the spectrum to translate their measurements into terms of other areas.

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Ethnology

ETHNOLOGY OF THE MAYAS OF SOUTHERN AND CENTRAL BRITISH HONDURAS—J. Eric Thompson—*Field Museum,* 210 p., $3. "A few embers of the fire of Maya culture still continue to glow dimly," writes Mr. Thompson. "It has been my aim to gather these isolated sparks before all is trampled out by the onward rush of what we, in our insularity, call progress." Ethnologists will be grateful for this publication salvaging so much regarding the religion, magic, industry, folklore, and other factors of native Mayan life.

Science News Letter, April 11, 1931

Psychology—Child Training

THE YOUNG CHILD AND HIS PARENTS—Josephine C. Foster and John E. Anderson—*University of Minnesota Press,* 247 p., $2. Those who realize that generalizations seldom apply to any one child will welcome this volume in which the problems connected with the upbringing of one hundred normal children are described separately. The lover of statistics will appreciate the summary in the introduction in which he may learn such facts as that the average number of "problems" per child was 2.9.

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Physics

MAGNETIC PHENOMENA, AN ELEMENTARY TREATISE—Samuel R. Williams—*McGraw-Hill,* 230 p., $3. A timely college book on this somewhat neglected field. Dr. Williams hopes to stimulate upper classmen and recent graduates to choose research in magnetism as a life interest and thus help fill the gap. This attractive study of the magnetics, mechanics, acoustics, electrics, thermics, and optics of magnetic phenomena puts the subject in quite a different light from the usual chapters of the electricity text.

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Geology

ELEMENTARY ECONOMIC GEOLOGY—H. Ries—*Wiley,* 360 p., $3.75. A well gotten up textbook suitable for university use.

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Ornithology

PADDLEWINGS — Wilfred S. Bronson—*Macmillan,* 106 p., $2. Not quite a year ago a new producer of books for children hove over the literary-artistic-scientific horizon, with a most charming work, "Fingerfins". With "Paddlewings" Mr. Bronson makes his second bow, telling quite as charmingly about a young penguin brought home by a recent scientific expedition to the Galápagos islands. The artist-author has an astonishing gift for finding simple and apt analogies to make his ideas stick, he has taken pains to be scientifically accurate, and he skillfully avoids the "writing down" flavor painfully evident in many books for children. Altogether, "Paddlewings" is a most worthy sib to "Fingerfins"; and it is to be hoped that they will be the first of a very large fratry.

Science News Letter, April 11, 1931

Chemistry—Geology

PETROLEUM FACTS AND FIGURES—*Public Relations Department—American Petroleum Institute,* 232 p., $2. The third edition of a useful handbook published by the petroleum industry.

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Biology—Philosophy

THE INTERPRETATION OF DEVELOPMENT AND HEREDITY—E. S. Russell—*Oxford,* 312 p., $5. "Materialism as a philosophical doctrine has long been dead, and as a scientific method its limitations are now becoming apparent." With this challenging sentence the author opens his chapter on The Organismal Point of View; and as wide a departure from the self-satisfied dogmatism of the late nineteenth century marks all of his utterances. He may be sharply disagreed with by some biologists, but he will be as vigorously championed by others. At any rate, Haeckel is dead and biologists are thinking again.

Science News Letter, April 11, 1931

Mathematics

STANDARD TABLE OF SQUARE ROOTS—L. M. Milne-Thomson—*Bell,* 50 p., $2.50. For computers. The square roots to eight significant figures of all four-figure numbers, with printed differences. The differences allow good estimates of numbers having more than four figures. Well printed.

Science News Letter, April 11, 1931